

Trend Analysis of GHG Emissions in TRIPURA

GHG Platform India is a civil society initiative providing an independent estimation and analysis of India's Greenhouse Gas (GHG) emissions across key sectors, namely- Energy, Industrial Processes and Product Use (IPPU), Agriculture, Forestry & Other Land Use (AFOLU) and Waste.

The Platform seeks to add value to the various ongoing GHG emission estimation efforts by helping address existing data gaps and data accessibility issues, extending beyond the scope of national inventories to state inventories, and by increasing the volume of analytics and policy dialogue on India's GHG emissions sources, profile, and related policies.

The initiative estimates and assesses GHG emissions and removals from the following sectors:



ENERGY



IPPU*



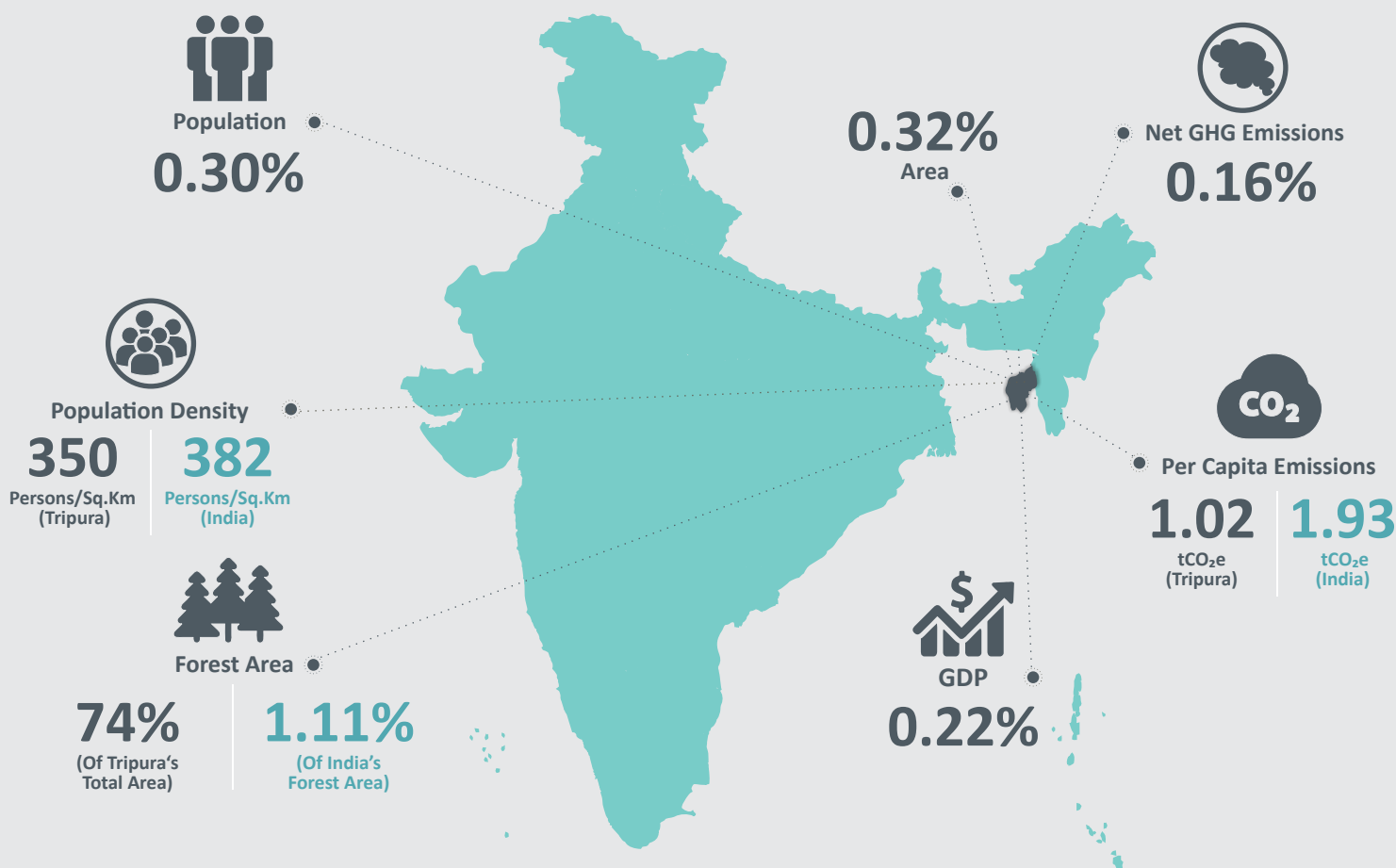
AFOLU



WASTE

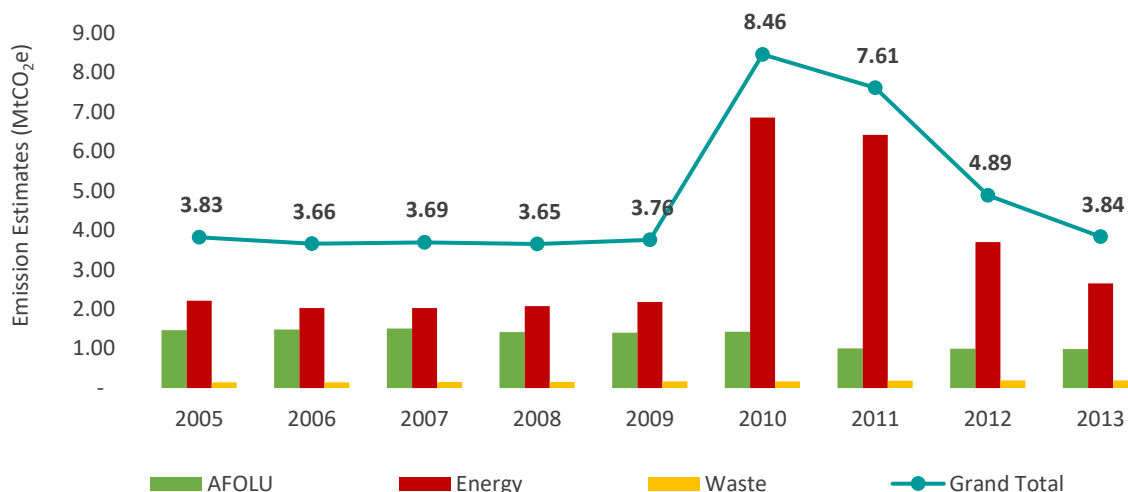
*Fuel combusted for Captive Electricity Generation (Auto-Producers) has been reported under Energy sector.

Tripura at a glance (2013)



Economy-wide Emission Estimates

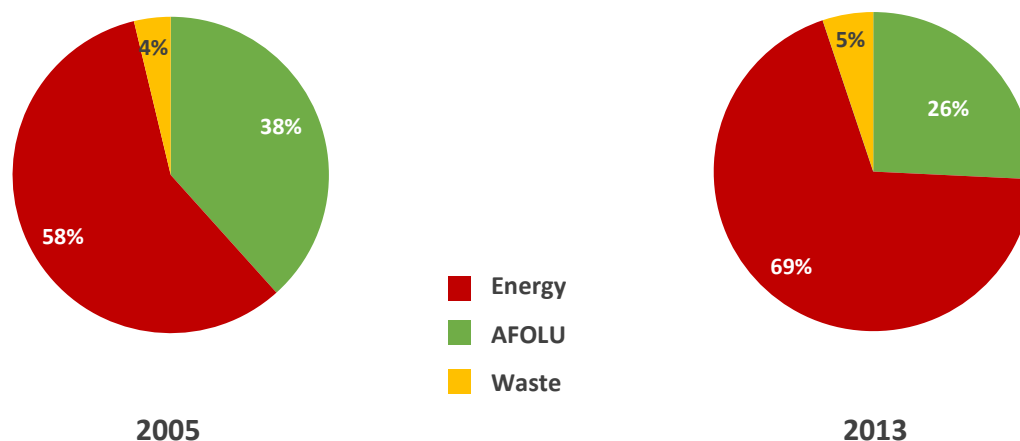
Figure 1: GHG Emission Estimates for Tripura (2005 to 2013)



Emissions of Tripura grew at a low CAGR¹ of 0.04% from 3.83 MtCO₂e in 2005 to 3.84 MtCO₂e in 2013². However, a significant bump in the total emissions of Tripura was observed in 2010 when the emissions rose to a high of 8.46 MtCO₂e due to increased emissions of the Energy sector and declined steeply thereafter. By 2013, the emissions were back down almost to 2005 levels as shown in Figure 1 above. Notably, no emissions were registered from the IPPU sector across all the reference years.

In 2005, the Energy sector had a major share of ~58% in the emissions of Tripura, followed by the AFOLU sector (~38%) and the Waste sector (~4%) respectively. Notably, the share of emissions from the Energy sector increased to ~69% while that of the AFOLU sector reduced to ~26% in 2013 as shown in Figure 2 below.

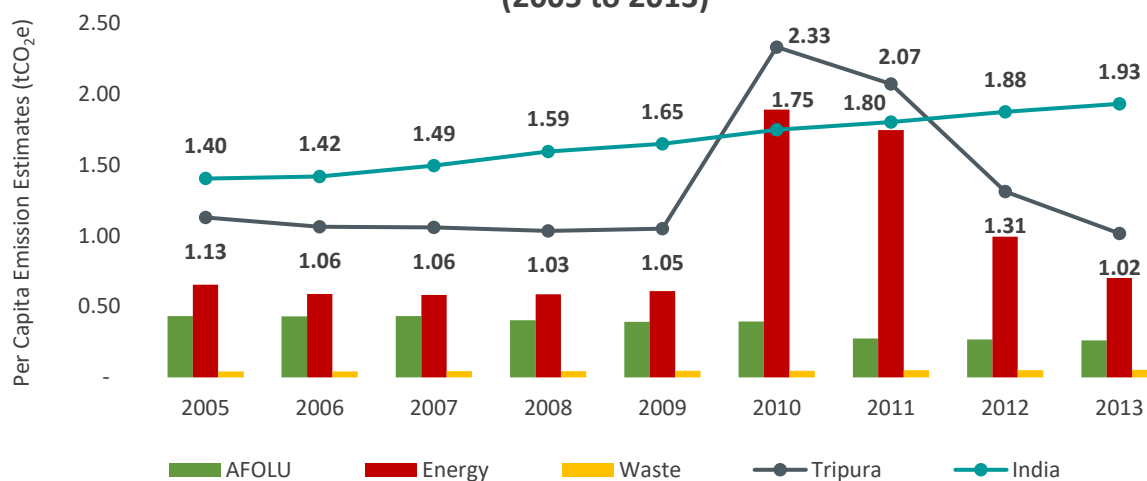
Figure 2: Sector-wise Contribution to Economy-wide GHG Emissions of Tripura



¹ Compound Annual Growth Rate

² Calendar year values have been considered for this analysis. For Global Warming Potential (GWP) calculations IPCC-ARII values have been considered.

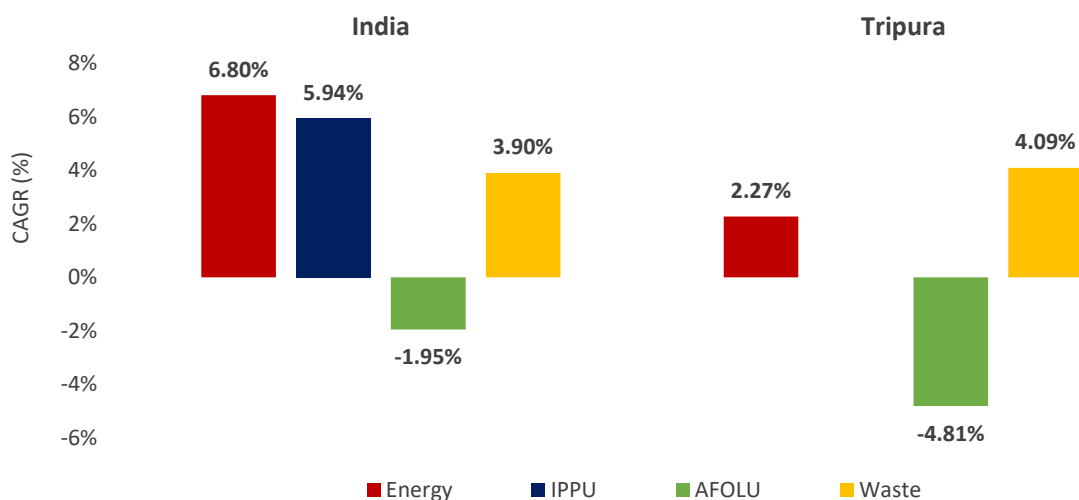
Figure 3: Per capita GHG Emissions for Tripura and India (2005 to 2013)



The per capita emissions of Tripura decreased from 1.13 MtCO₂e in 2005 to 1.02 MtCO₂e in 2013. When compared to India, the per capita emissions of the state were much lower than that of the country across all the years except in 2010 and 2011. The per capita emissions during this period were much higher than India due to a sudden rise in Energy emissions of the state as shown in Figure 3 above. The observed CAGR of the per capita emissions of India and Tripura were 4.07% (growth) and -1.02% (decline) from 2005 to 2013.

Figure 4: Sector-wise GHG Emissions Growth Rate from 2005 to 2013

These growth rates have been compounded annually.



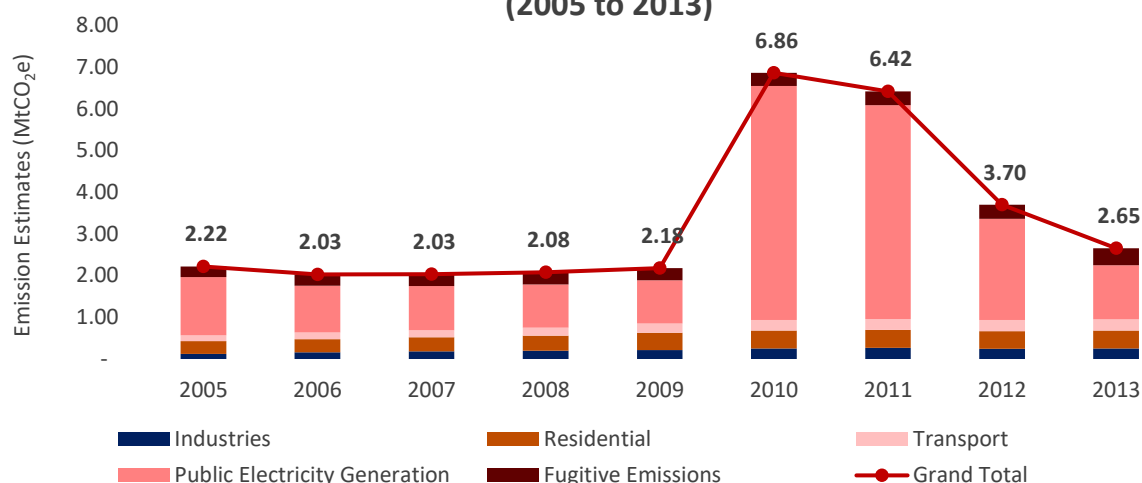
GHG emissions from the Waste sector of Tripura registered the highest CAGR of 4.09% from 2005 to 2013 followed by the Energy sector with a growth rate of 2.27%. Emissions from the AFOLU sector declined at a rate of -4.81% during the reference period as illustrated in Figure 4 above. When compared to India's sectoral growth/decline rates, only the Energy sector registered a lower growth rate in Tripura. Notably, the emissions of the AFOLU sector in Tripura declined at a higher rate when compared to India's AFOLU sector (-1.95%).



Energy Sector

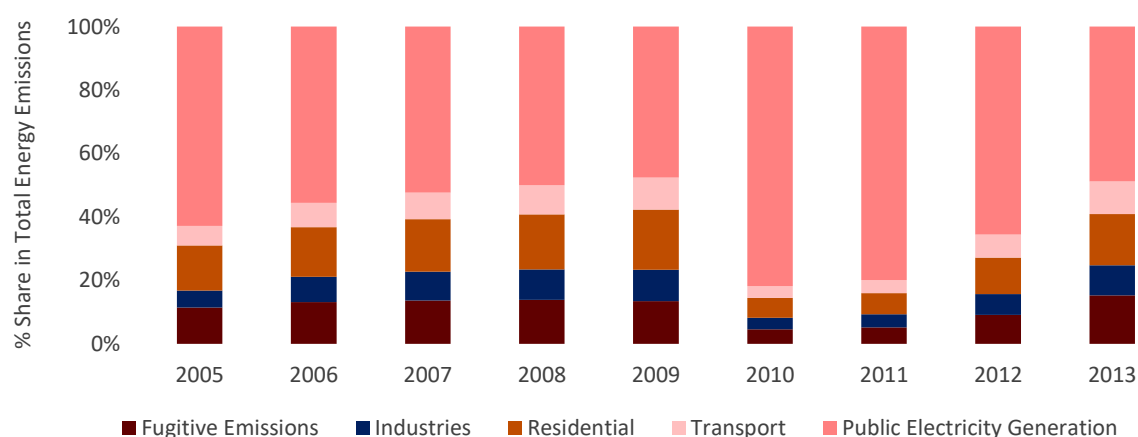
The Energy sector represented ~69% of the total emissions of Tripura in 2013. In general, emissions from the Energy sector arise from two main sub-sectors – Fuel Combustion (Public Electricity Generation, Transport, Industries and Agriculture, Commercial and Residential categories) and Fugitive. In 2013, ~85% of the total Energy emissions belonged to the Fuel Combustion sub-sector while the remaining ~15% were Fugitive. Emissions from this sector grew at an estimated CAGR of 2.27% from 2.22 MtCO₂e in 2005 to 2.65 MtCO₂e in 2013 as shown in Figure 5 below.

Figure 5: GHG Emission Estimates for Energy Sector in Tripura (2005 to 2013)



Public Electricity Generation remained the major emitter of GHGs from this sector across all the years as depicted in the Figure 6 below. However, the share of this category in the total Energy emissions reduced from ~63% in 2005 to ~49% in 2013. All the emissions in this category emanated from the electricity generated in the Natural Gas-based Power Plants of Tripura. An abrupt rise in the share of Public Electricity Generation emissions was observed in 2010 and 2011 owing to increased emissions from the Natural Gas-based Power Plants of the State. Notably, considerable amounts of Fugitive emissions were recorded in Tripura's Energy emissions portfolio, unlike most other Indian states, across the reference period due to handling and usage of Natural Gas in the state. Further, as already reported earlier in this document, there was a considerable bump in emissions from Public Electricity Generation in 2010, but it had tapered off almost completely by 2013.

Figure 6: Share of GHG Emissions from Energy Categories (2005 to 2013)

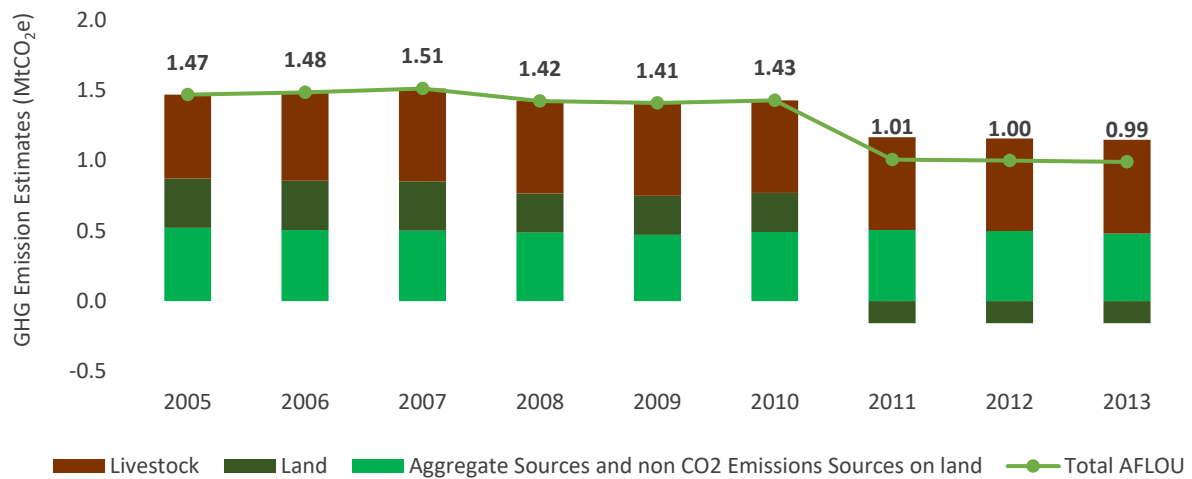




AFOLU Sector

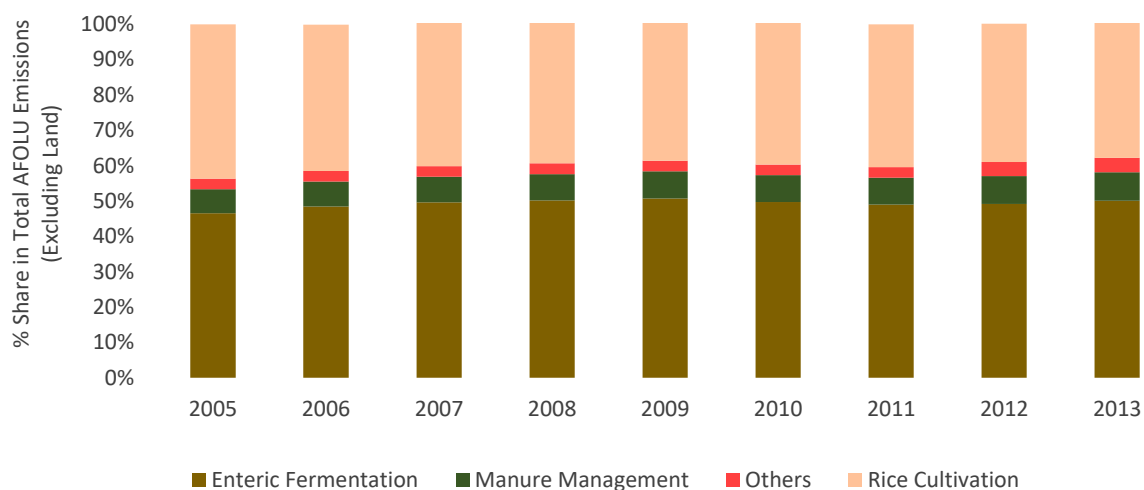
The AFOLU sector represented ~26% of the total emissions from Tripura in 2013. Emissions from the AFOLU sector arise from three main sub-sectors namely Livestock, Land and Aggregate Sources and Non-CO₂ Emissions Sources on Land. Notably, all the three sectors were net emitters till 2010. However, from 2011 onwards, the Land sub-sector acted as a net sink of GHG emissions. The emissions from this sector declined at a rate of 4.81% (compounded annually) from 1.47 MtCO₂e in 2005 to 0.99 MtCO₂e in 2013. A sudden dip in the overall AFOLU emissions was registered in 2011 owing to the transition of Land sub-sector from a net emitter to a net sink as illustrated in Figure 7 below.

Figure 7: GHG Emission Estimates for AFOLU Sector in Tripura (2005 to 2013)



Notably, the Livestock sub-sector was the major emitter of GHGs across all the reference years. Deep diving into the AFOLU sub-sectors, it was observed that under Livestock, Enteric Fermentation was the major contributor of emissions with an average share of ~49% across all the years (excluding Land). Under Aggregate Sources and Non-CO₂ Emissions Sources on Land, Rice Cultivation was found to be a major emitter of GHGs with an average share of ~40% from 2005 to 2013 as depicted in Figure 8 below.

Figure 8: Share of GHG Emissions from AFOLU Categories (Excluding Land) (2005 to 2013)





Waste Sector

The Waste sector contributed to ~5% of the total emissions of Tripura in 2013. Municipal Solid Waste³, Domestic Wastewater and Industrial Wastewater are the key sources of GHG emissions in the Waste sector. GHG emissions from Waste sector grew at an estimated CAGR of 4.09% from 0.143 MtCO₂e in 2005 to 0.197 MtCO₂e in 2013 as shown in Figure 9 below. A spike in emissions in 2011 was observed which can be attributed to higher Domestic wastewater emissions, which reflects changing trends in use of various treatment systems as reported in Census of India 2011.

Figure 9: GHG Emission Estimates for Waste Sector in Tripura (2005 to 2013)

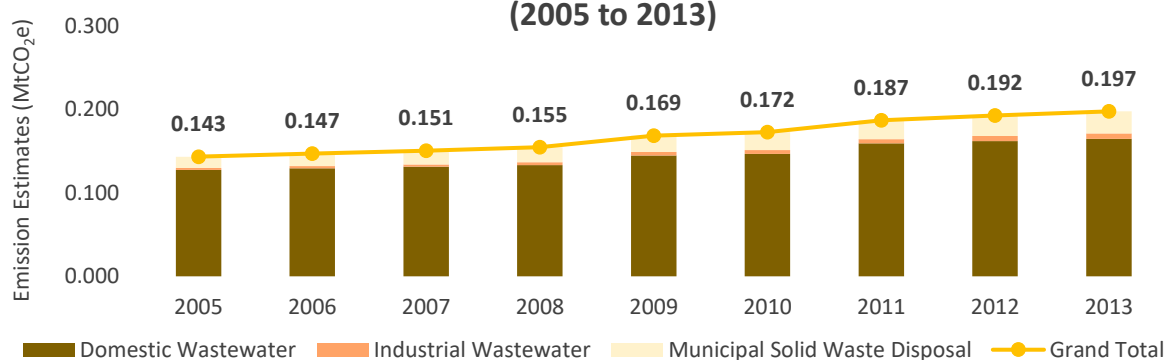
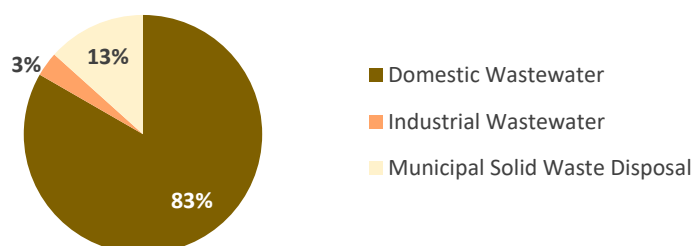


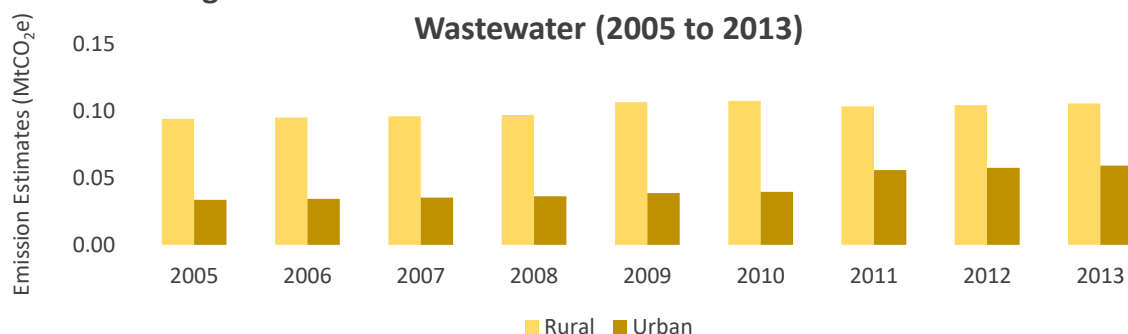
Figure 10: Category-wise Share of GHG Emissions for Waste Sector (in 2013)



Domestic wastewater had a share of ~83% in the total emissions from the Waste sector in 2013. Emissions from Domestic wastewater of rural and urban areas of Tripura grew at CAGR of 3.24% from 0.127 MtCO₂e in 2005 to 0.164 MtCO₂e in 2013. In 2013, almost 64% of the Domestic Wastewater emissions emanated from the rural areas of Tripura (Figure 11). Discharge of untreated wastewater and use of septic tanks are key drivers of emissions in this sub-sector.

Approximately 13% emissions of the waste sector were from Municipal Solid Waste Disposal in 2013. The emissions from this sub-sector grew at an estimated CAGR of 8.73% from 0.013 MtCO₂e in 2005 to 0.026 MtCO₂e in 2013. Industrial Wastewater emissions were nearly 3% of the emissions from the waste sector. Nearly all the emissions from this sub-sector were recorded from Dairy Industries in 2013.

Figure 11: Areawise GHG Emission Estimates From Domestic Wastewater (2005 to 2013)



³ 'Refers to emission in urban areas. Emissions from solid waste disposal in rural areas are not considered, as disposal predominantly occurs in a dispersed manner and does not generate significant CH₄ emissions'



IPPU Sector

No emissions were observed from the IPPU sector in the state of Tripura across all the reference years.



The GHG Platform India is a civil society initiative providing an independent estimation and analysis of India's Greenhouse Gas (GHG) emissions across key sectors, namely- Energy, IPPU, AFOLU and Waste.

The Platform comprises of the following civil society:



An initiative supported by



The **Council on Energy, Environment and Water (CEEW)** is one of South Asia's leading not-for-profit policy research institutions. It uses data, integrated analysis and strategic outreach to explain – and change – the use, reuse, and misuse of resources.

The **International Maize and Wheat Improvement Center (CIMMYT)** is the global leader in agricultural research for development in wheat and maize-based farming systems.

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Vasudha Foundation, set up in 2010, is a not for profit organisation, working in the clean energy and climate policy space.

WRI-India is a research organization that turns big ideas into action at the nexus of environment, economic opportunity and human well-being.

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